Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-25. Cancelled.

26. (Currently Amended) A method of bonding rubber to a metal substrate, the method comprising:

applying a silane solution comprising a substantially hydrolyzed bis amino-silane, ~~and~~ a substantially hydrolyzed bis sulfur-containing silane, and a nanosize particulate material to at least a portion of a surface of the metal substrate;

drying the silane solution on the metal substrate to form a coating having a thickness in the range from about 0.1 μm to about 1 μm thereon; and

applying an uncured, sulfur curable rubber onto the surface of the metal substrate having the coating thereon and sulfur curing the rubber to bond the rubber to the coated metal substrate.

27. (Currently Amended) The method of claim 26 further comprising, prior to applying the solution:

mixing a bis amino-silane and a bis sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the bis amino-silane and the bis sulfur-containing silane; and

mixing the hydrolyzed bis amino-silane, ~~and~~ the hydrolyzed bis sulfur-containing silane, and the nanosize particulate material together to form the solution to be applied to the metal substrate.

28. (Original) The method of claim 27 wherein the aqueous-based medium comprises water and alcohol.

29. (Previously Presented) The method of claim 27 wherein the bis amino-silane is a compound of the general formula I

$$(R^1O)_3\text{–Si–}R^2\text{–X–}R^2\text{–Si–}(OR^1)_3$$

wherein:

each R^1, independently, is selected from the group consisting of a C_1-C_{20} alkyl and C_2-C_{20} acyl;

each R^2, independently, is selected from the group consisting of a substituted or unsubstituted aliphatic and aromatic group;

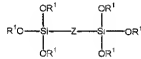
X is selected from the group consisting of

wherein each R^3, independently, is selected from the group consisting of hydrogen, substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, and alkynyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups; and

R^4 is selected from the group consisting of hydrogen, substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, and alkynyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups.

30. (Previously Presented) The method of claim 27 wherein the bis amino silane is selected from the group consisting of bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, and combinations thereof.

31. (Previously Presented) The method of claim 27 wherein the bis sulfur-containing silane is a compound of the general formula II



wherein:

each R^1, independently, is selected from the group consisting of substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, alkynyl, and acetyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups;

Z is -Q-S_x-Q, wherein each Q, independently, is an aliphatic or aromatic group; and

x is an integer from 2 - 10.

32. (Previously Presented) The method of claim 27 wherein the bis sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and a combination thereof.

33. (Previously Presented) The method of claim 26 wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane in a range from about 1:4 to about 4:1 by volume.

34. (Previously Presented) The method of claim 26 wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane of about 1:1 by volume.

35. (Original) The method of claim 26 wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution.

36. Cancelled.

37. (Currently Amended) The method of claim ~~36~~ **[[26]]** wherein the nanosize particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof.

38. (Currently Amended) The method of claim ~~36~~ **[[26]]** wherein the nanosize particulate material has an average particle size of about 0.1 μm or less.

39. (Currently Amended) The method of claim ~~36~~ **[[26]]** wherein the nanosize particulate material is silica and in a concentration range from about 10 ppm to about 1% by weight of the solution.

40. (Currently Amended) The method of claim ~~36~~ **[[26]]** wherein the nanosize particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution.

41. (Original) The method of claim 26 wherein drying comprises heating the silane solution on the metal substrate to a temperature of at least about 60°C.

42. (Original) The method of claim 26 wherein the coating formed has a thickness in the range from about 0.2 μm to about 0.6 μm.

43. (Previously Presented) The method of claim 26 wherein curing comprises applying heat and pressure to the rubber and coated metal substrate to form a bond therebetween.

44-45. Cancelled.

46. (Previously Presented) A method of bonding rubber to a metal substrate, the method comprising:

mixing bis amino-silane and a bis sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the bis amino-silane and the bis sulfur-containing silane;

mixing the hydrolyzed bis amino-silane, the hydrolyzed bis sulfur-containing silane, and a nanosize particulate material having an average particle size of about 0.1 μm or less, together to form a silane solution comprising a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane in a range from about 1:4 to about 4:1 by volume,

applying the solution to at least a portion of a surface of the metal substrate in an amount sufficient to form a coating to a thickness in the range from about 0.1 μm to about 1μm; and

drying the solution on the metal substrate to form the coating thereon;

applying an uncured, sulfur curable rubber onto the surface of the metal substrate having the solution applied thereon; and

sulfur curing the rubber with heat and pressure to bond the rubber to the metal substrate.

47. (Previously Presented) The method of claim 46 wherein the bis amino-silane is a compound of the general formula I

$$(R^1O)_3\text{–Si–}R^2\text{–X–}R^2\text{–Si–}(OR^1)_3$$

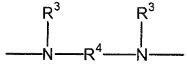
wherein:

each R^1, independently, is selected from the group consisting of a C_1-C_{20} alkyl and C_2-C_{20} acyl;

each R^2, independently, is selected from the group consisting of a substituted or unsubstituted aliphatic and aromatic group;

X is selected from the group consisting of

and

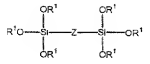


wherein each R^3, independently, is selected from the group consisting of hydrogen, substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, and alkynyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups; and

R^4 is selected from the group consisting of hydrogen, substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, and alkynyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups.

48. (Previously Presented) The method of claim 46 wherein the bis amino silane is selected from the group consisting of bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, and combinations thereof.

49. (Previously Presented) The method of claim 46 wherein the bis sulfur-containing silane is a compound of the general formula II



wherein:

each R^1, independently, is selected from the group consisting of substituted or unsubstituted, straight, branched or cyclic C_1-C_{20} alkyl, alkenyl, alkynyl, and acetyl groups and substituted or unsubstituted C_3-C_{20} aryl and alkylaryl groups;

Z is -Q-S_x-Q, wherein each Q, independently, is an aliphatic or aromatic group; and

x is an integer from 2 - 10.

50. (Previously Presented) The method of claim 46 wherein the bis sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and a combination thereof.

51. (Previously Presented) The method of claim 46 wherein the solution applied to the metal comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane of about 1:1 by volume.

52. (Original) The method of claim 46 wherein the nanosize particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof.

53. (Original) The method of claim 46 wherein the nanosize particulate material is silica and in a concentration range from about 10 ppm to about 1% by weight of the solution.

54. (Original) The method of claim 46 wherein the nanosize particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution.

55. (Original) The method of claim 46 wherein the coating formed has a thickness in the range from about 0.2 μm to about 0.6 μm.

56-96. Cancelled

97. (Previously Presented) The method of claim 26 wherein the sulfur curable rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof.

98. Cancelled.

99. (Previously Presented) The method of claim 46 wherein the sulfur curable rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof.

100. Cancelled.